Role of Chromatin Remodeler Snf2 in Meiotic Recombination, Sister-chromatid Cohesion, and Transcriptional Switch During Yeast Meiosis

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Abstract:

Chromatin Remodelers (CRs) play essential role in facilitating DNA-protein interactions for a variety of cellular processes such as DNA repair, recombination, and transcription regulation. Meiosis is a specialized cell division process by which the gametes are produced in eukaryotes. The contribution of CRs to facilitating various meiotic events such as meiotic recombination, synaptonemal complex assembly, loading of Rec8-cohesin, and regulation of transcriptional switching is poorly understood. This study aims to decipher the significance of CRs in meiosis-specific crucial events. We deleted or conditionally depleted the CR complexes' ATPase subunits (chd1Δ, isw1Δ, isw2Δ, swr1Δ, pCLB2-SNF2, pCLB2-INO80, pCLB2-STH1) and screened these mutants by quantifying sporulation efficiency and spore viability, as indicators of defects in meiosis and chromosome missegregation, which revealed that only the absence of Snf2 is detrimental to meiosis. Whereas, the depletion of other CRs does not affect meiosis significantly, suggesting some compensation mechanism for chromatin remodeling in their absence. Further analysis unveils that Snf2 is essential for meiotic DSB formation and the synaptonemal complex (SC) assembly. It also plays a role in the maintenance of the sister-chromatid cohesion by regulating the loading of Rec8-cohesin complexes. Additionally, Snf2 plays a vital role in maintaining the critical balance between the transcript isoforms during meiosis. In summary, this study demonstrates the significance of a SWI/SNF family CR in various meiosis-specific events.

Keywords:

Meiosis, Chromatin Remodeler, Meiotic recombination, Chromosome segregation, Transcript isoforms.